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*Mean squares of long Dirichlet polynomials with the divisor function  $\tau_2(n)$*

In this talk, I report on a joint work with Nathan Ng. We prove an asymptotic formula for mean values of long Dirichlet polynomials with coefficients  $\tau_2(n)$ . This establishes a special case of a conjecture of Conrey and Gonek (1998) that gives an asymptotic estimate for the mean square of the Dirichlet polynomial associated with the divisor function  $\tau_k(n)$ . Our asymptotic formula has all lower order terms with a power savings error term.